

PERANCANGAN SISTEM DETEKSI PENYAKIT OSTEOARTRITIS GENU BERDASARKAN EMISI AKUSTIK BERBASIS LABVIEW

Mochamad Arif Hidayat Ghojali
Program Studi D-IV Teknik Elektromedik,
Fakultas Kesehatan, Universitas Mohammad Husni Thamrin, Jakarta
Email: ariefghojali1404@gmail.com

ABSTRAK

Penilaian klinis kondisi sendi lutut terkait penyakit osteoarthritis *genu* sebagian besar dilakukan melalui pencitraan medis non-invasif menggunakan pemindaian sinar-X, pencitraan *ultrasound*, *Computerized Tomography* (CT), *Magnetic Resonance Imaging* (MRI), dan juga tindakan artroskopi secara invasif. Hanya saja tindakan ini memiliki beberapa keterbatasan, seperti prosedur yang kompleks, biaya dan fasilitas yang mahal, serta risiko terkait paparan radiasi. Maka, dikembangkan sebuah teknologi medis melalui metode *Acoustic Emission* (AE) untuk memantau kesehatan sendi secara non-invasif pada osteoarthritis *genu* disertai pengembangan aplikasi khusus berbasis LabVIEW untuk akuisisi dan analisis data. Dalam penelitian ini, digunakan metode *Software Development Life Cycle* (SDLC) sebagai kerangka kerja untuk merancang dan mengembangkan sistem yang diteliti. Hasilnya menunjukkan bahwa alat deteksi emisi akustik sendi lutut dapat berfungsi dengan baik dengan hasil pengukuran emisi akustik sendi *genu* pada kondisi Normal, Cedera, dan OA *Genu* menghasilkan amplitudo di atas ambang batas 36 dB atau 63 μ V dengan total Hit AE masing-masing mencapai 7 Hit, 58 Hit, dan 157 Hit. Rata-rata maksimum amplitudo dan *Percentase Incidence* (PI) sebesar 27 μ V (1,4%), 154 μ V (11,6%), dan 129 μ V (31,4%). Kejadian Hit AE selama gerakan ekstensi-fleksi terkonsentrasi paling banyak terjadi pada rentang sudut 0°-30° mencapai 40,54%, pada rentang sudut 30°-60° sebesar 34,68%, dan 60°-90° sebesar 24,77%. Tingkat kejadian Hit AE dengan persentase paling tinggi, menunjukkan kondisi sendi lutut pada osteoarthritis *genu*.

Kata Kunci: Osteoarthritis Genu, Emisi Akustik, INMP441

DESIGN OF A SYSTEM FOR DETECTING OSTEOARTHRITIS GENU BASED ON KNEE JOINT ACOUSTIC EMISSIONS USING LABVIEW

Mochamad Arif Hidayat Ghojali
Study Program D-IV Electromedical Engineering,
Faculty of Health, Mohammad Husni Thamrin University, Jakarta
Email: ariefghojali1404@gmail.com

ABSTRACT

Clinical assessment of knee joint condition related to osteoarthritis genu is mostly done through non-invasive medical imaging using X-ray scans, ultrasound imaging, Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), as well as invasive arthroscopy. However, these treatments have several limitations, such as complex procedures, expensive costs and facilities, and risks related to radiation exposure. So, a medical technology was developed through the Acoustic Emission (AE) method to non-invasively monitor joint health in genu osteoarthritis along with the development of a special LabVIEW-based application for data acquisition and analysis. In this research, the Software Development Life Cycle (SDLC) method was used as a framework to design and develop the system under study. The results show that the knee joint acoustic emission detection tool can function properly with the results of acoustic emission measurements of the genu joint in Normal, Injured, and OA Genu conditions producing amplitudes above the 36 dB or 63 μV threshold with a total AE Hit reaching 7 Hits, 58 Hits, and 157 Hits respectively. The average maximum amplitude and Percentage Incidence (PI) were 27 μV (1.4%), 154 μV (11.6%), and 129 μV (31.4%). The incidence of Hit AE during concentrated flexion-extension motion was highest in the 0°-30° angle range at 40.54%, in the 30°-60° angle range at 34.68%, and 60°-90° at 24.77%. The incidence rate of Hit AE with the highest percentage, indicating the condition of the knee joint in genu osseteoarthritis

Keywords: Osteoarthritis Genu, Emisi Acoustics, INMP441